Radar Equipment HMAS *Shropshire*

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When *"Shropshire"* was being prepared in England for handing over to the R.A.N. in 1942/43, she was fitted out with a full complement of the current R.N. equipment. The following list of equipment in numerical order of type number includes other equipment installed later.

Type 273. SURFACE WARNING. Wavelength 10 cm (Frequency 3,000 Megacycles). Located just forward of the after control position. Antenna gyrostabilised, located in a "lantern" structure directly on top of office. Also connected to an accurate range display panel in the T.S.

Type 277. AIRCRAFT TRACKING. Wavelength 10 cm. fitted during a refit in mid 1945. Antenna on foremast. Office in new extension on port side of bridge structure. Single "dish" antenna controlled for bothelevation and bearing enabled this equipment to provide information on the exact location of an aircraft.
AIR WARNING. Frequency 90 megacycles. Transmitting antenna on mainmast with transmitter in office at base of the mast. Receiving antenna on foremast with receiving office on flag deck at base of mast. Antennas rotated in synchronism. The 281 was undoubtedly Shropshire's most important radar unit! More on this later.

Type 282. For control of multiple pom poms, one set for port and one for starboard.

Type 283. AUTO BARRAGE UNITS. One for each turret. Each set had a control station with display unit on the upper deck. Main office below decks. The purpose of these sets was to enable efficient use of the main armament against dive bombers. We found them quite useful when there were kamikazis around.

Each of these sets was equipped with a small fire control device – a sort of mechanical computer. When the main armament guns were loaded with shells fitted with a time fuse, generally set for a different time in each barrel, this device would calculate the correct time and fire the gun so that the point at which the shell exploded was the point at which the aircraft would be if it continued on the same course and speed.

Type 284. GUNNERY CONTROL MAIN ARMAMENT. Antenna mounted on the main armament director. Officve below decks, accurate range display panel in the TS provided range and bearng for main armament fire control.

Type 285. 4 INCH ANTI-AIRCRAFT GUNS Antenna mounted on after director – high angle control position. Office below decks. Provided range and bearing for anti-aircraft fire control.

Power supplies to all of the gunnery control radars were combined in an integrated system. All sets operated at the same frequency, around 600 Megacycles. Power was supplied from a large motor alternator set with output 180 volts at 500 cycles, which was their pulse repetition frequency, and interferrence was avoided by having a phase difference between the power supplied to each set

Type SG. An American unit of 10 cm wavelength fitted soon after we joined the 7th Fleet. Antenna on foremast, PPI display in plot below bridge. Used for surface navigation as well as surface warning.

RADAR COUNTER MEASURES. Equipment consisted of multi-band receivers and a type 91 jamming transmitter.

CAPABILITY REPORT

During service in the New Guinea and Philippines campaigns HMAS *Shropshire* achieved a reputation for, among other things, the efficiency of reporting of aircraft movements (Editor's note, see appendix below). I will attempt to explain, briefly, how I consider this was achieved.

This efficiency was due to a combination of:-

The nature of the equipment
Maintenance and tuning
Skill of the operators
Efficiency of the plotting office
Team work

Nature of the equipment. The primary air warning radar was Type 281. This was a rugged piece of equipment built in the style of the R.N. long range W/T sets. The output stage of the transmitter gave an impression of power with quartz "tubes" about 12 cm. in diameter and 40 cm. long.

The transmitting antenna was on the mainmast and the receiving antennas on the foremast. They were broadside style arrays with timber frame, ceramic insulators, and aluminium dipoles. The feeder for the transmitter was of twin wires held apart by plastic insulators. The receiver feeder was "Pyrotenax"

On the flag deck at the base of the foremast was the receiving office. In this were all components of the receiver, including the display and the controller for rotation of the antennas as well as the telephones.

Maintenance and tuning. Because of wartime shortages in England, the materials used for the construction of exposed parts were not always as durable as they could have been. This factor, added to the severity of the tropical conditions in which we were operating, resulted in the need for frequent maintenance work to maintain peak performance. Careful attention was given to this, which included much masthead work, varnishing woodwork and cleaning insulators – even on one occasion, at night in the tail end of a typhoon, to wash off salt spray which was causing sparking while the ship was darkened.

As regards tuning, one feature of the 281 was that most units where tuning was was critical were designed so that they could be tuned to maximise performance. This is different from many other radars where such units are preset and changes over time can adversely affect performance.

Skill of the operators. The display was a cathode ray tube about 15 cm in diameter, known as an "A" scan. (Editors note: See description of "A" scan in the chapter "Radar Basics"). The operator had control of the rotation of the antennas, which rotated in synchronism, and he would adjust the angle of the antennas relative to the fore and aft line of the ship to maximise the "pip" and find the bearing of the aircraft. Some refinements in technique would provide an estimate of the height of the aircraft.

This information would be telephoned to the Plotting Office.

To accurately maintain reports on a number of aircraft on this type of equipment required a a great deal of skill on the part of the operator. There would be two operators on watch and they would relieve each other from time to time. *Shropshire* was fortunate in having a number of men with this ability.

Efficiency of the Plotting Office. As well as receiving the reports of aircraft detected by the ship's radar this office was in communication with other ships in the fleet, friendly aircraft and shore bases. Reports of aircraft positions were plotted on a large board. At times a great deal of information was processed and personnel became very skilled. The officer in charge was of a temperament well suited to his position. *Shropshire's* callsign was "PORTHOLE" and this name became famous as a source of information on warnings of hostile aircraft.

Team work. As with all operations in a fighting ship the overall efficiency depended on team work. In *Shropshire* there had been very few changes in personnel and all members of the ship's company had learnt to work together.

This undoubtedly was an important factor in all operations. Perhaps the reports that she was a "Lucky Ship" also had some validity.

Appendix

Extract from "Royal Australian Navy 1942 – 1945" by G Herman Gill. Quote from Leyte Nov – Dec 1944 page 536 "*The American destroyer Ammen referred to the superb Radar telling performed so steadily and reliably by the Shropshire during the operations against the enemy just completed. The information provided by Porthole (Shropshire's communication designation) was of inestimable value in maintaining the Ammen alert and ready to deal with the Nips at all times"*

Further, in a letter to Captain Nicholls, Admiral Weyler remarked that "*Commander Task Group 77.1 concurs that Shropshire's performance in radar telling was outstanding and takes this opportunity to congratulate her Commanding Officer, and all officers and men who contributed thereto. As a matter of fact Shropshire's excellent performance in subject matter has heretofore been attested in reports submitted to Superior Command.*

As well, pages 182 and 183 of Stan Nicholls book "HMAS *Shropshire*", published by the Naval Historical Society of Australia December 1989 (ISBN 0 958 7456 2) quotes a number of high commendatory remarks about *Shropshire's* radar efficiency, made by senior officers of the USN, & RN.